

The Effect of Ultrasound Scanning on the State Anxiety among Expectant Mothers in Their First Trimester and Predictors of Anxiety

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Abstract

Background: Undergoing ultrasound scanning (USS) during the first trimester of pregnancy is highly imperative for expecting mothers, as it supports the early detection of any malformations, identifying the fetal number, fetal growth, fetal sex, and calculation of delivery. Previous studies have shown that undergoing such prenatal screening procedures could reduce the antenatal anxiety levels of expectant mothers. The present study aimed to explore the impact of first-trimester ultrasound scanning towards the antenatal anxiety and identify the predictors of antenatal anxiety among expectant mothers in the first trimester. Methods: A repeated measure design study was conducted in Maternity Clinics of University Hospital KDU, Ninewells Care Hospital and Navy General Hospital over 4 months with one hundred and fifteen (n = 115) expectant mothers. Participants completed a general information sheet first and State Trait Anxiety Inventory (STAI) (Spielberger et al., 1970) was administered before and after undergoing the USS. **Results:** Mean age of the participants was 28.84 ± 3.68 . The Wilcoxon Signed Rank test showed that there is a significant reduction of participants' antenatal anxiety levels following the USS z = -5.658, p < 0.001, with an effect size of r = 0.37. The hierarchical multiple regression analysis showed that partner's support was a significant predictor of antenatal anxiety among the expectant mothers in the first trimester. Conclusions: Findings suggest that undergoing the first trimester USS significantly reduces the antenatal state anxiety and partner's support is an important factor in reducing the antenatal anxiety experienced by expectant mothers in the first trimester. Future studies can focus on how USS can contribute to alleviating antenatal anxiety in second and third trimesters.

Keywords

Antenatal Anxiety, State Anxiety, First Trimester, Ultrasound, Pregnancy

1. Introduction

In the realm of maternal healthcare, the profound journey of pregnancy is marked not only by physiological changes but also by intricate psychological dynamics. When a woman enters pregnancy, she undergoes a series of changes in her physical body, appearance, hormones, emotions, thoughts, and behaviours. These adjustments would necessitate a shift in her lifestyle, including her way of thinking and coping methods. Changes in the mental state such as "Stress" could emanate psychological and physiological issues to both the mother and the baby [1]. In addition to stress, an expecting mother might also go through psychological disturbances such as anxiety, fear, worries about mother's and baby's postnatal and antenatal well-being, worries about labour, delivery of the baby and her lifestyle after birth [2]. Along with the advancement of the medical field, there is a growth of studies investigating the influence of these changes on the well-being of infants. Simultaneously, researchers are also concerned about how they influence the mother's well-being in the long run [3].

Unlike in the past, expectant mothers undergo different screening procedures during the gestation period to ensure a healthy and safe pregnancy. Ultrasound scanning (USS) helps in the early detection of problems that might prevail during pregnancy (ex: fetal health and complications). Screening techniques incorporate high frequencies to project a scanned image of the fetus along with several other detections [4]. Undergoing USS throughout different stages of gestation benefits both the mother and clinician in identifying the fetal number, calculation of delivery date, fetal growth, fetal sex and malformations [5]. One of the key objectives of conducting USS during the first trimester of gestation is to identify the location of the fetus, fetal number, calculation of delivery date, the risk of fetal down syndrome [6]. In addition to these clinical benefits, USS imaging assists parents (particularly mothers) in developing an emotional attachment to their unborn child, thereby improving the mother's psychological preparation for birth [7].

Typically, pregnant mothers encounter emotional distress throughout the gestational period, with maternal concerns regarding the well-being and development of the baby significantly contributing to the onset of maternal anxiety during pregnancy [8]. Drawing from prior research, factors such as parity, parental selfefficacy, partner support, previous history of miscarriage, as well as demographic attributes like age, educational attainment, and economic status have been identified as predictors of antenatal anxiety [9]-[12]. A study carried out in the United States documented higher levels of anxiety and depression in expectant mothers who have lower partner support during their gestation [13]. Findings from different parts of the world have shown that undergoing USS during the first trimester supports in alleviating the antenatal anxiety of mothers [14]. Nevertheless, to date, there remains a dearth of studies investigating the potential association between ultrasound scanning (USS) and its influence on antenatal anxiety, as well as the predictors of antenatal anxiety, within the context of expectant mothers in South Asia.

Earlier research indicates a notable decrease in antenatal anxiety among expectant mothers subsequent to undergoing ultrasound scanning (USS), compared to their anxiety levels prior to the procedure. Moreover, anxiety appears to be more pronounced among mothers during the first trimester than those in the subsequent second and third trimesters [14] [15]. Further, the consensus in the field is that the feedback and conduct of clinicians significantly contribute to antenatal anxiety and stress [16]. In light of this, it becomes imperative for clinicians to be attuned to the psychological well-being of the mother while delivering their feedback. Adopting a tailored approach during the screening process and subsequent feedback provision is paramount. Within the framework of the Sri Lankan healthcare system, the application of patient-centered care is infrequently observed, particularly when addressing apprehensive or emotionally susceptible mothers. Research underscores the prevalence of suboptimal care concerning Person-centered maternity care (PCMC) within prominent healthcare establishments throughout Sri Lanka [17]. In the clinical context of Sri Lanka, certain deficiencies are apparent, wherein the authoritative demeanor of clinicians and elements of coercion have the potential to induce fear within patients, further exacerbating maternal anxiety. Consequently, the current investigation seeks to underscore the significance of prioritizing the psychological well-being of expectant mothers-specifically their anxiety and stress levels-during prenatal screening procedures, with the ultimate goal of fostering a healthy pregnancy and ultimately improving birth outcomes.

Previous studies show that anxiety during pregnancy can have an impact on the brain development and other adverse birth outcomes such as maternal and neonatal mortality [18]. The absence of comprehensive psychoeducational initiatives concerning antenatal anxiety significantly contributes to the deficiency in maternal mental health support available to mothers in Sri Lanka. Thus, this current study also serves the purpose of delineating the predictors that elevate the risk of antenatal anxiety among mothers, while simultaneously assessing the impact of ultrasound scanning (USS) on antenatal anxiety. The identification of these predictors holds the potential to empower the maternal community by mitigating adverse factors, ultimately leading to an enhanced pregnancy and childbirth experience.

The rationale behind pinpointing these predictors lies in comprehending the ways in which contextually and culturally unique factors can influence antenatal anxiety within the Sri Lankan context. Given that numerous investigations have primarily focused on high-income countries, it becomes paramount to shift attention towards Low- and Middle-Income countries (LMICs) as well.

Particularly in Low- and Middle-Income Countries (LMICs), there is a compelling need to address anxiety reduction and enhance psychosocial adaptation in expectant mothers, in order to mitigate the potential repercussions of these circumstances. Sri Lanka, characterized by its diverse ethnic and cultural makeup, highlights a significant challenge wherein a substantial proportion of expectant mothers encounter constrained availability of mental health services, particularly for matters pertinent to their pregnancy [19]. Therefore, the significance of discerning the prevalent mental health concerns among expectant mothers in Sri Lanka, influenced by the effects of screening procedures, becomes evident. Expectant mothers on the same token, prompting an exploration into how ultrasound scanning interfaces with the complex interplay of stress and adaptation during this transformative period is of absolute necessity. This study highlights the need for the establishment of effective mental health services within the realm of pregnancy and prenatal testing, aiming to foster favourable birth outcomes and enhance the psychological, physiological, and social dimensions of maternal wellbeing.

2. Objectives and Hypotheses

2.1. General Objective

To understand how the first-trimester Ultrasound scanning can influence the antenatal anxiety among first-trimester expectant mothers in Sri Lanka.

2.2. Specific Objectives

1) To determine the state anxiety level of expectant mothers before and after their first trimester USS.

2) To compare antenatal anxiety prior to and following the USS.

3) To explore the predictors of antenatal anxiety in the expectant mothers who are undergoing their first trimester USS.

2.3. Hypotheses

 H_1 : Antenatal anxiety levels before the first-trimester Ultrasound scanning is higher than the anxiety levels after the scanning.

H₂: Age, highest educational qualification, partner's support, parity and history of miscarriage predict antenatal anxiety.

3. Methodology

3.1. Research Design

This study adopted a quantitative descriptive research approach utilizing a repeated measures design.

3.2. Study Setting, Sample and Sampling Method

The present study was conducted at selected Obstetrics and Gynaecology clinics

of at the University Hospital Kotelawala Defence University (UHKDU), Navy General Hospital (NGH) and at the Ninewells Hospital, Colombo, with the participation of expectant mothers registered in these clinics. The sample comprised pregnant mothers in their initial trimester, scheduled for an Ultrasound scanning as part of the prenatal screening procedure. A total of 115 participants were enrolled in the study, with participant recruitment accomplished through purposive sampling.

Sample size calculation for a repeated measure design:

$$n = 2 * \left\{ \frac{\left(f(\alpha, \beta) \sigma^2 \right)}{\delta^2} \right\}$$
$$n = 2 * \left\{ \frac{7.9 * 8^2}{6^2} \right\}$$
$$n = 28 \text{ participants}$$

Inclusion criteria of the study were expectant mothers who were in the first trimester of their pregnancy and were about to undergo an Ultrasound scanning (Prenatal screening procedure).

Exclusion criteria of the present study are stated below:

1) Expectant mothers who were in their second and third trimesters of the pregnancy.

2) Expectant mothers who were in the first trimester, but have already completed their Ultrasound scanning for the 1st trimester.

- 3) Expectant mothers with acute illnesses/diseases.
- 4) Expectant mothers with intellectual disabilities.

3.3. Study Procedure

Notices detailing the study were displayed on the notice boards within the clinic premises of UH-KDU, Ninewells Hospital, and NGH, in all three languages: Sinhala, English, and Tamil. Expectant mothers received information sheets containing essential details about the study, including its purpose, voluntary participation, the right to withdraw, selection criteria, potential benefits and risks, and contact information. Once participants had familiarized themselves with the study, they were provided with informed consent forms to declare their consent for the participation in the study. These information sheets and consent forms were available in all three languages, allowing participants to complete them in their preferred language.

After obtaining participants' consent to participate in the research, they were provided with a demographic questionnaire (General Information Sheet). This questionnaire solicited fundamental socio-demographic details from the participants, such as age, highest educational attainment, income level, parity, history of miscarriage and stillbirths. Additionally, the questionnaire featured a rating scale enabling mothers to evaluate the support received from their own mothers, partners, in-laws, and friends during this period of childbirth. Subsequent to the completion of the demographic questionnaire, participants were administered the State Anxiety Inventory (STAI) questionnaire to gauge their current anxiety levels. This questionnaire was administered both prior to and subsequent to the USS procedure, facilitating an evaluation of the participants' state anxiety before and after the screening process.

3.4. Measures/Study Instruments

State-Trait Anxiety Inventory

STAI is a measure of both State anxiety and Trait anxiety, and it includes 20 items for each anxiety type and altogether it has 40 items [20]. For the purpose of data collection in the study, only the 20 items assessing State anxiety were used. The inventory employs a Likert scale format with four points [1 = Not at all, 2 = Somewhat, 3 = Moderately, 4 = Very Much). A higher score on the scale corresponds to a heightened level of state anxiety [21]. STAI has a higher Cronbach's Alpha value of 0.86, demonstrating a higher internal consistency [22]. It also has given a higher test-re-test value of 0.85 [23]. STAI has a higher content validity when correlated with Taylor Manifest Anxiety Scale and Cattell and Scheier's Anxiety Scale Questionnaire, where the correlations were 0.73 and 0.85 respectively [22].

3.5. Instrument Validation

STAI does not have Sinhala and Tamil translations, which were then validated for the use within the Sri Lankan context. Therefore, STAI was translated and validated using expert review.

The documents were translated, validated and adapted while abiding by the World Health Organization recommended translation and adaptation procedure for health related study instruments [24]. Translated STAI was sent to Psychiatrists and Psychologists. The Sinhala translation of STAI was reviewed by Consultant Psychiatrist Dr. Thushani Henegama, Clinical Psychologist, Mrs. Uwasara Arambewale Weerakoon and Consultant Psychiatrist, Dr. Indika Mudalige. Tamil translation of STAI was reviewed by Consultant Psychatrist, Dr. M. Ganesan, Clinical Psychologist, Ms. Diluxshy Sanjeevan and Clinical Psychologist, Mrs. Sinduja Nandakumar. All the reviewers for Sinhala translation were native speakers of Sinhala language, with bilingual fluency and all the reviewers for Tamil translation were native speakers of Tamil language with bilingual fluency.

The State Trait Anxiety Inventory (STAI) lacked translations in Sinhala and Tamil, necessitating validation for its applicability in the Sri Lankan context. Consequently, the STAI underwent translation and validation through expert review. The translation, validation, and adaptation process adhered to the recommended methodology for health-related study instrument translation and adaptation set forth by the World Health Organization [24]. The translated version of STAI was submitted to Psychiatrists and Psychologists for evaluation. For the Sinhala translation, Consultant Psychiatrist Dr. Thushani Henegama, Clinical Psychologist Mrs. Uwasara Arambewale Weerakoon, and Consultant Psychiatrist Dr. Indika Mudalige reviewed the document. Similarly, for the Tamil translation, Consultant Psychiatrist Dr. M. Ganesan, Clinical Psychologist Ms. Diluxshy Sanjeevan, and Clinical Psychologist Mrs. Sinduja Nandakumar conducted the review. All reviewers for the Sinhala translation were native speakers of the Sinhala language with bilingual proficiency, while all reviewers for the Tamil translation were native Tamil speakers with bilingual proficiency.

Upon expert review and verification of accurate correspondence between the translated versions and the original English questionnaire, the translated STAI was subjected to pre-testing. The pre-testing phase involved the engagement of three expectant mothers within the appropriate clinic settings.

3.6. Ethical Approval of the Study

Data collection of this study was commenced right after obtaining the ethical approval from the Ethics Review Committee of the School of Humanities and Social Sciences of University of West London, UK (UWL). In addition to the ethical approval from UWL, ethical approval from the Ethics Review Committee of Faculty of Medicine, General Sri John Kotelawala Defence University in Sri Lanka was also obtained. Gatekeeper permission was obtained from, and the Executive director of UHKDU, commanding officer of NGH, and relevant consultants. After gaining the rightful permissions, the notices were displayed at the clinics, participants were informed and data were collected according to the above-mentioned procedure.

Stringent measures were taken to ensure the confidentiality and anonymity of participants' data. All data were securely stored in a password-protected computer, limited to access by the investigators. Participants were required to use their unique participant scode on all documents, and any information that could potentially identify them was carefully omitted to guarantee both anonymity and confidentiality. These safeguards align with the provisions outlined in the Data Protection Act (2018).

3.7. Data Analysis

Preliminary analyses were conducted to compare the antenatal anxiety before and after USS. Wilcoxon signed rank tests were executed to compare the anxiety scores before and after the USS. Separately, a multiple hierarchical regression analysis was employed to explore the predictors of antenatal anxiety in relation to USS during first-trimester of pregnancy.

To conduct hierarchical multiple regression, the three categorical variables of highest educational qualification, partner's support and parity were changed into dichotomous categorical variables.

The variable for the highest educational qualification was dichotomized into two categories: participants who were G.C.E advanced level qualified and those who were not. Partner's support was classified into two categories whether the participants received optimal support (Strongly Agree) or sub optimal support (anything below "Strongly Agree"). Parity was also classified into two groups: participants with one child or more, and participants with less than one child.

The rest of predictor variables, age (continuous variable) and miscarriage history (dichotomous) were not changed.

4. Results

Hundred and fifteen (N = 150) (Mean Age = 28.84, SD = 3.68) expectant mothers who are in the first trimester, undergoing the first-trimester ultrasound scanning took part in the study. 96% of the participants were Sinhalese, while 3% of them were Tamil and 1% were Burgher. Majority of the participants had completed a Diploma after A/L (34%) and Bachelor's degree (27%). 36% of participants had an income more than 60,000 LKR and another 36% of the participants had an income between 25,000 to 60,000 LKR. A higher percentage of the participants (54%) have not given birth to children before, and the rest have already given birth for one child or more. 85% of the participants strongly agreed that their partner was supportive during this pregnancy (**Table 1**).

Table 1. Descriptive statistics of the sample.

Descripti	Number (N)	
	Sinhalese	110
Ethnicity	Tamil	3
	Burgher	2
	Postgraduate	14
	Bachelor's degree	31
Highest Educational Qualifications	Diploma After A/L	39
	G.C.E. A/L Passed only	6
	Grade 6 - 11 only	2
	Less than 25,000 LKR	33
Participant's approximate income (monthly)	25,000 LKR - 60,000 LKR	41
	More than 60,000 LKR	41

In the preliminary analysis, the assumption of normality was violated (W = 0.87, (114) p < 0.05) Therefore, a Wilcoxon signed rank test was conducted to compare the median antenatal anxiety levels before and after ultrasound scanning. The dependent variable is a continuous variable (Antenatal anxiety before and after the ultrasound scanning and the independent variable is a categorical variable, consisting related groups (Before and after ultrasound scanning).

Wilcoxon Signed Rank Test (**Tables 2-6**) revealed that there was a significant reduction of anxiety levels after the scanning procedure, z = -5.658, p < 0.001, with an effect size of r = 0.37. The median antenatal anxiety score before the Ultrasound scanning reduced from (Md = 33) to post Ultrasound scanning (Md = 26).

 Table 2. Descriptive statistics of the Wilcoxon signed rank test.

					Percentiles	
	Ν	Mean	Std. Deviation	25th	50th (Median)	75th
Overall anxiety before	115	33.80	9.469	25.00	33.00	42.00
Overall anxiety after	115	28.16	7.675	22.00	26.00	32.00

Table 3. Test statistics for wilcoxon signed rank test (Comparison of antenatal anxiety levels).

	Overall anxiety after - Overall anxiety before
Z	-5.658b
Asymp. Sig. (2-tailed)	0.000

The preliminary analyses were conducted prior to the testing and the sample size of the study was appropriate to conduct a hierarchical multiple regression analysis. There was a linear relationship between the dependent variable and each of the independent variables. No violation of assumption of multicollinearity was reported as all VIF values were below 10. Maximum value of Cook's distance was 0.152, depicting that there are no outliers. The critical value for Mahalanobis distance for 5 independent variables was 20.52, and the maximum value for this data set was 20.38. Thus, there were no outliers in this dataset.

Table 4. Summary of hierarchical multiple regression for predictors of antenatal anxiety.

Variable	Beta	t	R	R Square	R Square Change
Step 1					
Age	0.005	0.052	0.005	0.000	0.000
Step 2			0.053	0.003	0.003
Age	0.003	0.030			
Highest Educational Qualification	0.053	0.558			
Step 3			0.097	0.009	0.007
Age	0.005	0.048			

Continued					
Highest Educational Qualification	0.068	0.710			
Miscarriage History	-0.083	-0.858			
Step 4			0.102	0.010	0.001
Age	-0.008	-0.079			
Highest Educational Qualification	0.073	0.748			
Miscarriage History	-0.082	-0.849			
Parity	0.034	0.330			
Step 5			0.243	0.059	0.049
Age	-0.029	-0.287			
Highest Educational Qualification	0.100	1.038			
Miscarriage History	-0.111	-1.67			
Parity	0.002	0.023			
Partner's Support	-0.288	-2.376			

 Table 5. Correlations table for overall anxiety after the USS.

		Overall anxiety after	Age	HEQ*	Miscarriage	Parity	Partner's Support
	Overall anxiety after	1.000	0.005	0.053	-0.069	0.024	-0.202
	Age	0.005	10.000	0.039	0.027	0.363	-0.140
	HEQ	0.053	0.039	10.000	0.191	-0.129	0.108
Pearson Correlation	Miscarriage	-0.069	0.027	0.191	10.000	-0.034	-0.104
	Parity	0.024	0.363	-0.129	-0.034	10.000	-0.183
	Partner's support	-0.202	-0.140	0.108	-0.104	-0.183	1.000
	Overall anxiety after	0.0	0.479	0.288	0.230	0.398	0.015
	Age	0.479	0.0	0.341	0.386	0.000	0.067
	HEQ	0.288	0.341	0.0	0.021	0.084	0.126
Sig. (1-tailed)	Miscarriage	0.230	0.386	0.021	0.0	0.360	0.134
	Parity	0.398	0.000	0.084	0.360	0.0	0.025
	Partner's support	0.015	0.067	0.126	0.134	0.025	0.0

*HEQ: Highest Educational Qualifications.

	Model	Sum of Squares	df	Mean Square	F	Sig.
	Regression	0.162	1	0.162	0.003	0.958 ^b
1	Residual	6715.021	113	59.425		
	Total	6715.183	114			
	Regression	18.783	2	9.391	0.157	0.855°
2	Residual	6696.400	112	59.789		
	Total	6715.183	114			
	Regression	62.949	3	20.983	0.350	0.789 ^d
3	Residual	6652.234	111	59.930		
	Total	6715.183	114			
	Regression	69.547	4	17.387	0.288	0.885 ^e
4	Residual	6645.636	110	60.415		
	Total	6715.183	114			
	Regression	396.769	5	79.354	01.369	0.242^{f}
5	Residual	6318.414	109	57.967		
	Total	6715.183	114			

 Table 6. ANOVA table for hierarchical multiple regression for predictors of antenatal anxiety.

Hierarchical multiple regression was used to assess the ability of five independent variables (Age, Highest Educational Qualifications, Parity, Miscarriage History and Partner's support) to predict antenatal anxiety after the Ultrasound scanning. Preliminary analyses were conducted and no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity were reported. For the first block, Age was entered and Age did not significantly contribute for the model. After the addition of Highest Educational Qualifications variable for the second block, only 0.3% of the total variance was explained by the model F (2, 112) = 0.15, Beta = 0.053, p > 0.05. When Miscarriage history was added to the model, only 0.9% of the total variance was explained F (3, 111) = 0.35, Beta = -0.083, p > 0.05, the R² Change was low as 0.003. Parity was added as a variable to the third model and 1% of the variance could be explained by the model F (4, 110) = 0.28, Beta = 0.034, p>0.05, R² Change = 0.001. Once the Partner's support (Husband's support) variable was added to the model, 5.9% of the total variance was explained, F (5, 109) = 1.36, p > 0.05 and R² Change = 0.049. However, Partner's support was the only statistically significant independent variable with the overall antenatal anxiety score, with a beta value of (Beta = -0.23, p < 0.05).

The model with the five variables was not significant and the model is not a good fit to predict antenatal anxiety of first-trimester mothers who underwent

their ultrasound scanning.

Partner's support was the only variable that significantly predicted antenatal anxiety with a beta co-efficient of -0.288.

5. Discussion

The present study was conducted in the aim of understanding how the ultrasound scanning during the first trimester of pregnancy influences the antenatal anxiety expecting mothers in Sri Lanka. Additionally, the study aimed to identify factors that could predict antenatal anxiety in these expecting mothers. The research was carried out with the underlying hypotheses that age, highest educational qualifications, history of miscarriage, parity and partner's support could serve as predictors of antenatal anxiety in expecting mothers who underwent ultrasound scanning during the first trimester.

Based on the results of the Wilcoxon Signed Rank test, it was revealed that the antenatal anxiety levels after the USS were significantly lower than the antenatal anxiety before USS.

The multiple hierarchical regression analysis conducted to determine the predictors of antenatal anxiety demonstrated that the model with five predicting variables of age, highest educational qualifications, parity, miscarriage history of miscarriage and partner's support was not a good fit of a model to predict antenatal anxiety of this sample. However, it was noted that only partner's support was able to significantly predict the antenatal anxiety of the expecting mothers expectant mothers who underwent the USS. To date, no studies other than the current study have focused on addressing the psychological importance of USS in pregnancy in the context of Sri Lanka. These findings underscore the significance of ultrasound scanning (USS) as a prenatal screening method that also contributes to the psychological well-being of expectant mothers [25]. The current study further validated that partner's support serves as a predictor of antenatal anxiety, implying that greater antenatal anxiety tends to correlate with lower levels of partner support. These findings are in alignment with prior research outcomes, thus underscoring the universal significance of partner support in safeguarding the mental well-being of mothers [13].

On the other hand, the study suggests how the clinician's feedback may affect the mother's mental well-being which is often normalized by the clients, when they experience positive health outcomes [17]. Maternal mental health is rarely brought into discussion in Sri Lankan households, where the attention is mostly paid towards the physical health of both the mother and the baby. Even though things are now evolving for the better, there is still a gap maternal mental health and well-being of the mother should be treated as a priority in the Sri Lankan context [26].

6. Strengths and Limitations of the Study

A significant strength of this study is it being the first study of its kind conducted

in Sri Lanka. It comprehensively examined antenatal anxiety and its predictors among expectant mothers who underwent ultrasound scanning during their first trimester. In fact, current study is the only study conducted in Sri Lanka that focused on mental health outcomes of prenatal screening in Sri Lanka. Given that the present study exclusively focuses on expectant mothers within the first trimester, the collected data exhibits a higher level of homogeneity. Furthermore, the participants were drawn from three distinct hospital settings: UH-KDU, Ninewells Hospital, and Navy General Hospital. This inclusion of both governmental and non-governmental sectors adds a layer of diversity to the sample, encompassing variations in socio-economic status, educational backgrounds, and individual characteristics. Highlight of the present study is that it is focused on the situational emotional state, state anxiety of expectant mothers related to Ultrasound scanning and that it measures the anxiety before and after the screening procedure. Into the bargain, this study considered predictors of anxiety and psychosocial factors such as history of miscarriage, which are less discussed in majority of the research conducted within the Sri Lankan context.

One limitation of this study is that it only considered expectant mothers who are in their first trimester and mothers from the second and third trimester were not included in the sample, making the results generalizable only to the expectant mothers in their first trimester. Because of time constraints, this study adopted a cross-sectional methodology with a repeated measures design. However, it's important to note that this study does not follow a longitudinal approach, which would have allowed for the observation of variations in anxiety levels and psychosocial adaptation across different trimesters. An additional limitation of this study is that it solely focused on participants' mental health history. Medical history was not considered. It is worth noting, though, that the majority of participants did not disclose any prior mental health concerns. This could be a result of socially desirable behaviour, lack of education and inherent biases. The sample size needs to be increased as this affects the distribution of variables measured in the study; especially partner's support. Moreover, the measurement encompassed solely the state anxiety levels prior to and subsequent to the screening procedure. Furthermore, a significant proportion of the participants were of Sinhalese ethnicity and were married, thereby limiting the extent to which the findings can be generalized across different ethnicities and marital statuses. Additionally, anxiety is not identified as a personality trait in the present research, which is directly related to state anxiety levels of the participants. Hence, the identification of predictors or anxiety could be further improved by including the measurement of anxiety as a personality trait in future studies.

7. Implications of Study Results

The present study stands out as a pioneering effort within Sri Lanka, concentrating on antenatal anxiety in the context of prenatal screening. The study findings indicate that undergoing ultrasound scans (USS) may have a mitigating effect on antenatal anxiety, underscoring the significance of USS and the feedback provided in addressing the expectant mother's anxiety and broader psychological distress.

The study's results underscore the crucial role of clinicians in their approach and delivery of feedback to patients, as this aspect substantially contributes to the psychological well-being, coping mechanisms, and psychosocial adjustment of expectant mothers. The study identifies partner support as a notable predictor of antenatal anxiety among expectant mothers in Sri Lanka, highlighting the pivotal role of such support in preventing antenatal anxiety. Within the Sri Lankan context, the burden placed upon women who carry a fetus, encompassing both its physical and psychological aspects, tends to be overlooked, while the unequal distribution of responsibilities to partners is often deemed acceptable. Consequently, conveying this message to Public Health Midwives, who serve as the primary point of contact for expectant mothers at the grassroots level, would be advisable. This outreach could serve as the foundation for crafting interventions intended to diminish anxiety and promote enhanced psychosocial adaptation during the course of pregnancy.

8. Future Directions of the Study

The present research took a quantitative approach, but there is scope for delving deeper into the lived experiences and viewpoints of expectant mothers. As a result, for a future study, a qualitative investigation, involving semi-structured interviews, could be more beneficial. This would facilitate a more comprehensive understanding of the experiences, psychosocial support, cognitive processes, thoughts, behaviours, and even psychological distress encountered by expectant mothers. Consequently, there's potential for this study to evolve into a mixed-methods design in the future. A key limitation of the study could be the absence of a control group of participants who do not undergo the USS and if implemented in future studies, this would provide a more robust explanation of the effect of screening procedures on reducing anxiety. The current study could also be extended in the future by including expectant mothers in second and third trimester and study the impact of USS screening on the psychological outcomes of pregnancy as a whole. Since the sample of the current study only represent Colombo and Gampaha districts of Sri Lanka, findings may not be applicable to mothers from rural Sri Lanka. Therefore, there is an opportunity to carry out the current study on a national level, aiming to comprehend the antenatal experiences of expectant mothers from various districts. Only the state anxiety was assessed as the measure of anxiety in the current study, suggesting the potential for future studies to incorporate "Trait anxiety" as an additional anxiety measure. Furthermore, an interventional study can be conducted wherein with the provision of an educational intervention to one group of mothers.

9. Conclusions

Limited attention has been given to understanding how pregnancy screening

procedures might influence maternal anxiety and identifying the factors contributing to it. This subject remains relatively unexplored within the Sri Lankan context, even though it holds essential implications for nurturing patient-centered care within the existing healthcare system.

The findings unequivocally indicate that undergoing a first-trimester ultrasound scan leads to a reduction in antenatal anxiety. Moreover, the study underscores the significant role of partner support as a predictor of antenatal anxiety. This study opens up numerous avenues for further research in the field.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- La Marca-Ghaemmaghami, P. and Ehlert, U. (2015) Stress during Pregnancy. *European Psychologist*, 20, 102-119. <u>https://doi.org/10.1027/1016-9040/a000195</u>
- [2] Bjelica, A., Cetkovic, N., Trninic-Pjevic, A. and Mladenovic-Segedi, L. (2018) The Phenomenon of Pregnancy—A Psychological View. *Ginekologia Polska*, 89, 102-106. <u>https://doi.org/10.5603/gp.a2018.0017</u>
- [3] Wallace, K. and Araji, S. (2020) An Overview of Maternal Anxiety during Pregnancy and the Post-Partum Period. *Journal of Mental Health & Clinical Psychology*, 4, 47-56. <u>https://doi.org/10.29245/2578-2959/2020/4.1221</u>
- Whitworth, M., Bricker, L. and Mullan, C. (2015) Ultrasound for Fetal Assessment in Early Pregnancy. *Cochrane Database of Systematic Reviews*, 2015, CD007058. <u>https://doi.org/10.1002/14651858.cd007058.pub3</u>
- [5] Jones, A.K. and Reed, S.A. (2017) Benefits of Ultrasound Scanning during Gestation in the Small Ruminant. *Small Ruminant Research*, **149**, 163-171. <u>https://doi.org/10.1016/j.smallrumres.2017.02.008</u>
- [6] D'Alton, M.E. and Cleary-Goldman, J. (2005) Additional Benefits of First Trimester Screening. Seminars in Perinatology, 29, 405-411. <u>https://doi.org/10.1053/j.semperi.2006.01.010</u>
- [7] Richter, L., Slemming, W., Norris, S.A., Stein, A., Poston, L. and Pasupathy, D. (2020) Health Pregnancy, Healthy Baby: Testing the Added Benefits of Pregnancy Ultrasound Scan for Child Development in a Randomized Control Trial. *Trials*, 21, Article No. 25. <u>https://doi.org/10.1186/s13063-019-3924-0</u>
- [8] Deklava, L., Lubina, K., Circenis, K., Sudraba, V. and Millere, I. (2015) Causes of Anxiety during Pregnancy. *Procedia—Social and Behavioral Sciences*, 205, 623-626. <u>https://doi.org/10.1016/j.sbspro.2015.09.097</u>
- [9] Biaggi, A., Conroy, S., Pawlby, S. and Pariante, C.M. (2016) Identifying the Women at Risk of Antenatal Anxiety and Depression: A Systematic Review. *Journal of Affective Disorders*, 191, 62-77. <u>https://doi.org/10.1016/j.jad.2015.11.014</u>

- [10] Brunton, R., Simpson, N. and Dryer, R. (2020) Pregnancy-Related Anxiety, Perceived Parental Self-Efficacy and the Influence of Parity and Age. *International Journal of Environmental Research and Public Health*, **17**, Article 6709. https://doi.org/10.3390/ijerph17186709
- [11] Rezaee, R. and Framarzi, M. (2014) Predictors of Mental Health during Pregnancy. Iranian Journal of Nursing and Midwifery Research, 19, S45-S50. <u>https://journals.lww.com/jnmr/fulltext/2014/19071/predictors_of_men-</u> tal_health_during_pregnancy.7.aspx
- [12] Woods-Giscombé, C.L., Lobel, M. and Crandell, J.L. (2010) The Impact of Miscarriage and Parity on Patterns of Maternal Distress in Pregnancy. *Research in Nursing & Health*, **33**, 316-328. <u>https://doi.org/10.1002/nur.20389</u>
- [13] Cheng, E.R., Rifas-Shiman, S.L., Perkins, M.E., Rich-Edwards, J.W., Gillman, M.W., Wright, R., *et al.* (2016) The Influence of Antenatal Partner Support on Pregnancy Outcomes. *Journal of Women's Health*, **25**, 672-679. <u>https://doi.org/10.1089/jwh.2015.5462</u>
- [14] Harpel, T.S. (2008) Fear of the Unknown: Ultrasound and Anxiety about Fetal Health. *Interdisciplinary Journal for the Social Study of Health, Illness and Medicine*, 12, 295-312. <u>https://doi.org/10.1177/1363459308090050</u>
- [15] Businelli, C., Bembich, S., Vecchiet, C., Cortivo, C., Norcio, A., Risso, M.F., et al. (2021) The Psychological Burden of Routine Prenatal Ultrasound on Women's State Anxiety across the Three Trimesters of Pregnancy. European Journal of Obstetrics & Gynecology and Reproductive Biology, 256, 281-286. https://doi.org/10.1016/j.ejogrb.2020.11.065
- [16] McCarthy, M., Houghton, C. and Matvienko-Sikar, K. (2021) Women's Experiences and Perceptions of Anxiety and Stress during the Perinatal Period: A Systematic Review and Qualitative Evidence Synthesis. *BMC Pregnancy and Childbirth*, 21, Article No. 811. <u>https://doi.org/10.1186/s12884-021-04271-w</u>
- [17] Rishard, M., Fahmy, F.F., Senanayake, H., Ranaweera, A.K.P., Armocida, B., Mariani, I., et al. (2021) Correlation among Experience of Person-Centered Maternity Care, Provision of Care and Women's Satisfaction: Cross Sectional Study in Colombo, Sri Lanka. PLOS ONE, 16, e0249265. <u>https://doi.org/10.1371/journal.pone.0249265</u>
- [18] Newman, L., Judd, F. and Komiti, A. (2017) Developmental Implications of Maternal Antenatal Anxiety Mechanisms and Approaches to Intervention. *Translational Developmental Psychiatry*, 5, Article 1309879. https://doi.org/10.1080/20017022.2017.1309879
- Bright, K.S., Norris, J.M., Letourneau, N.L., King Rosario, M. and Premji, S.S. (2018)
 Prenatal Maternal Anxiety in South Asia: A Rapid Best-Fit Framework Synthesis. *Frontiers in Psychiatry*, 9, Article 467. <u>https://doi.org/10.3389/fpsyt.2018.00467</u>
- [20] Spielberger, C.D., Gorsuch, R.L. and Lushene, R.E. (1970) Manual for the State-Trait Anxiety Inventory. <u>http://ubir.buffalo.edu/xmlui/handle/10477/2895</u>
- [21] Bieling, P.J., Antony, M.M. and Swinson, R.P. (1998) The State-Trait Anxiety Inventory, Trait Version: Structure and Content Re-Examined. *Behaviour Research and Therapy*, **36**, 777-788. <u>https://doi.org/10.1016/s0005-7967(98)00023-0</u>
- [22] Julian, L.J. (2011) Measures of Anxiety: State-Trait Anxiety Inventory (STAI), Beck Anxiety Inventory (BAI), and Hospital Anxiety and Depression Scale-Anxiety (HADS-A). Arthritis Care & Research, 63, S467-S472. https://doi.org/10.1002/acr.20561
- [23] Vitasari, P., Wahab, M.N.A., Herawan, T., Othman, A. and Sinnadurai, S.K. (2011) Re-Test of State Trait Anxiety Inventory (STAI) among Engineering Students in

Malaysia: Reliability and Validity Tests. *Procedia—Social and Behavioral Sciences*, **15**, 3843-3848. <u>https://doi.org/10.1016/j.sbspro.2011.04.383</u>

- [24] WHO (2010) Process of Translation and Adaptation of Instruments. https://www.who.int/substance_abuse/research_tools/translation/en/
- [25] Pleş, L., Hamoud, B.H., Dimitriu, M.C.T., Cîrstoveanu, C., Socea, B., Ionescu, A., et al. (2021) Psycho-Emotional Impact of Anomaly Ultrasound Scan in Romanian Pregnant Women. *Healthcare*, 9, Article 1415. <u>https://doi.org/10.3390/healthcare9111415</u>
- [26] Wyatt, S., Ostbye, T., de Silva, V. and Long, Q. (2022) Antenatal Depression in Sri Lanka: A Qualitative Study of Public Health Midwives' Views and Practices. *Reproductive Health*, 19, 1-10. <u>https://doi.org/10.1186/s12978-022-01330-z</u>

Appendix 1

Gen	eral Information Sheet	
Participant ID: Date:		
1) Please state you age		
	1) Sinhalese	
	2) Tamil	
	3) Muslim	
2) Ethnicity	4) Burgher	
	5) Other	
	If other, please specify	
	1) Married	
	2) Separated	
3) Marital Status	3) Divorced	
	4) Living together (Never married)	
	1) Postgraduate Degree	
	2) Bachelor's Degree	
	3) Diploma following Advanced Leve	el (A/L)
Highest Educational	4) G.C.E. Advanced Level (A/L) pass	ed
Qualification	5) G.C. E. Ordinary Level (O/L) pass	ed
	6) Grade 6 to 11	
	7) Grade 1 to 5	
	8) Did not attend school	
Please state your approximate monthly income		
Please state your spouse's approximate monthly income		
· · · · · · · · · · · · · · · · · · ·		1) Yes
nave you had any miscarriages pr	eviously:	2) No
TT 1.1 (111) - 1.5		1) Yes
Have you had any stillbirths?		2) No
		1) Yes
Have you been diagnosed (curren	tly or previously) with a mental illness?	2) No

Continued	
If so, please state them (optional)	
11	1) Yes
Have you ever given birth for children before?	2) No

Please state to which extent, from "Strongly Disagree" to "Strongly Agree", do you agree for the following statements.

	1) Strongly Disagree
	2) Disagree
My husband is supportive to me during this pregnancy	3) Neutral
	4) Agree
	5) Strongly Agree
	1) Strongly Disagree
	2) Disagree
My parents are supportive to me during this pregnancy	3) Neutral
	4) Agree
	5) Strongly Agree
	1) Strongly Disagree
	2) Disagree
My in-laws are supportive to me during this pregnancy	3) Neutral
	4) Agree
	5) Strongly Agree
	1) Strongly Disagree
	2) Disagree
My friends and other relatives are supportive to me during this pregnancy	3) Neutral
anne and krogenne)	4) Agree
	5) Strongly Agree

Appendix 2

State Trait Anxiety Inventory

Read each statement and select the appropriate response to indicate how you feel right now, that is, at this very moment. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	1	2	3	4
	Not at all	A little	Somewhat	Very much s
1) I feel calm				
2) I feel secure				
3) I feel tense				
4) I feel strained				
5) I feel at ease				
6) I feel upset				
7) I am presently worrying over possible misfortunes				
8) I feel satisfied				
9) I feel frightened				
10) I feel uncomfortable				
11) I feel self-confident				
12) I feel nervous				
13) I feel jittery				
14) I feel indecisive				
15) I am relaxed				
16) I feel content				
17) I am worried				
18) I feel confused				
19) I feel steady				
20) I feel pleasant				

Appendix 3: Prenatal Self-Evaluation Questionnaire (PSEQ-II)

(Lederman, 2006)

Directions

The statements below have been made by expectant women to describe themselves. Read each statement and decide which response best describes your feelings. Then circle the appropriate letter next to each statement.

Very Much so 4 Moderately so 3 Somewhat so 2Not at all 1

- 1 This is a good time for me to be pregnant
- 2 I like to watch other parents and children together
- 3 I can bear the discomforts I've had with this pregnancy
- 4 My husband/partner and I talk of the coming baby
- 5 My husband/partner criticizes me during this pregnancy
- 6 I feel that raising children is rewarding
- 7 I feel I need to know what happens in labour
- 8 I can cope well with pain
- 9 It's hard to get used to the changes that come with pregnancy
- My husband/partner is understanding (calms me) when I get upset
- 11 I think I can do well during labour
- 12 I think my labour and delivery will be normal
- 13 I believe there is nothing I can do to prepare for labour
- 14 My mother shows interest in the coming baby
- 15 I am confident that I can maintain emotional control in labour
- 16 I am worried that the baby will be abnormal
- 17 I think the worst when I have a pain
- 18 Realizing that labour will end will help me maintain control
- 19 I look forward to caring for the baby
- 20 My mother is happy about my pregnancy
- 21 My mother offers helpful suggestions
- 22 I have enjoyed this pregnancy.
- My husband/partner is interested in discussing the pregnancy with me
- 24 I have a good idea of what to expect during labour and birth
- 25 I understand how to work with the contractions in labour
- 26 I look forward to giving birth
- I am afraid the doctors and nurses will not listen to my concerns in labour
- 28 It's easy to talk to my mother about my problems
- 29 I wonder whether I can be a good mother
- 30 I worry about all the problems the baby might have
- 31 My mother looks forward to this grandchild
- 32 I am glad I'm pregnant
- 33 I like having children around me
- 34 It will be hard for me to balance childcare with everything else I do
- 35 My husband/partner helps me at home when I need it

Continued

- 36 My husband/partner is willing to talk about changes in our sex life
- 37 I feel good when I'm with my mother
- 38 I am preparing myself for labour
- 39 I am concerned that I will lose control in labour
- 40 I can count on my husband/partner's support in labour
- 41 I am afraid that I will be harmed during delivery
- 42 I feel that caring for babies might not be much fun
- ${}^{\rm 43}$ My husband/partner thinks I bother him with my feelings and problems
- 44 When we get together, my mother and I tend to argue
- 45 It will be difficult for me to give enough attention to a baby
- 46 I think the baby will be a burden to me
- 47 I feel prepared for what happens in labour
- 48 I know some things I can do to help myself in labour
- When the time comes in labour, I'll be able to push even if it's painfu
- 50 I have ideas about the kind of mother I want to be
- 51 I am anxious about complications occurring in labour
- 52 I feel that the stress of labour will be too much for me to handl
- 53 I think I can bear this discomfort of labour
- ⁵⁴ I am concerned that caring for a baby will leave me little time for myself
- 55 My mother reassures me when I have doubts about myself
- 56 I feel well informed about labour
- 57 I am worried that something will go wrong during labour
- 58 It's difficult to accept this pregnancy
- 59 My mother encourages me to do things in my own way
- I think my husband/partner would say he is satisfied with the
- sexual adjustment we have made during this pregnancy
- 61 This has been an easy pregnancy
- 62 I wish I wasn't having the baby now
- 63 I worry that I will lose the baby in labour
- 64 If I lose control in labour, it will embarrass me
- 65 My mother criticizes my decisions
- 66 I'm having problems adjusting to this pregnancy
- 67 I wonder if the baby will like me
- 68 I focus on all the terrible things that could happen in labour
- 69 This pregnancy has been a source of frustration to me
- 70 I can count on my husband/partner to share in the care of the baby

Continued

- 71 I am confident that I will have a normal childbirth
- 72 I feel that childbirth is an exciting event
- 73 I feel I already love the baby
- 74 I have found this pregnancy gratifying
- 75 I believe I can be a good mother
- 76 I have regrets about being pregnant at this time
- 77 I find many things about pregnancy disagreeable
- 78 I feel I will enjoy the baby
- 79 I am happy about this pregnancy